# SRP Support for Acnet

*Alarm scan enhancement*

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***Introduction***

Digital alarms are supported in IRM/local station systems via the use of "combined status" words. Binary status bits are sampled from wherever they occur in the digital interface and combined to form a status word. The status word is supplied as the reading of what is normally an analog channel. Thus, these values are stored in the analog data table (ADATA). To indicate that it is not really an analog (numeric) value, it is tagged with the Pattern bit (mask $4000) in the alarm flags field of the ADATA entry. This bit is sensed by the analog alarm scan logic so that the check for an alarm condition can be made by a digital algorithm rather than an analog algorithm.

The digital status word, from the reading field, is exclusive-ORed against the nominal status word and masked with the pattern mask. (The nominal status word is housed in the nominal field of the ADATA entry; the pattern mask is in the tolerance field.) If the result is nonzero, the device is in the BAD state, else it is in the GOOD state. When a device changes its GOOD/BAD state, the appropriate alarm message is generated.

A digital alarm message is currently sent to Acnet alarm handler AEOLUS in an ERP message format. Then AEOLUS sends the digital alarm text message to each alarms display client.

The above description is how digital alarms are prepared for Acnet using ERPs.

***SRP plan***

An enhancement was made to Acnet alarms handling at some time after the original design. It was done in order to permit multiple text messages to be displayed for a single digital status device. In simple terms, one might imagine generating a separate message for each status bit in the BAD state. But the new support was more flexible than that. The digital alarm text property (DGALTX) was expanded to permit up to 32 sets of digital alarm text, so that up to 32 messages might be displayed in response to a single digital status going BAD. For each such digital alarm text, an associated mask and condition value is specified. A new format for digital alarm message was designed to support this case. The new SRP format includes an error status word, consisting of 1's for each bit that is in the BAD state. The error status word is sometimes called an SOS, for "status of statuses."

Armed with the SOS word, AEOLUS loops through all digital alarm text messages, ANDing the SOS word with each mask and comparing the result with the corresponding condition value. For each such match that is found, an error message is sent to the console clients to be displayed.

One may prefer not to have so many messages capable of being produced by a single digital device. To specify only one such message, in the case that SRPs are sent to AEOLUS, the DGALTX property is set to have one digital alarm text, specifying a mask of zero and a condition value of zero. (In the case that ERPs are sent to AEOLUS, there can

be only a single message text produced, since there is no SOS word available to choose among multiple text messages.)

Acnet gurus propose that all front ends return SRP-formated digital alarm messages in order to permit the possibility of generating more that one digital alarm message in response to a change in the alarm state of a digital status device.

***Front end support for SRP***

The message format for an SRP is quite simple. In place of the reading word, the SOS word is used. The reading is present following the SOS word, although it is not necessarily used by AEOLUS. (It is used if there is special encoding in the text of the message that causes AEOLUS to insert its value, say in hex, within the message.)

But for a front end to support the generation of SRPs, the alarm scanning logic must be changed. Rather than merely detecting whether a digital device is BAD, it is necessary to check whether its SOS changes. Thus, it is possible that a front end will have to produce successive BAD messages, each with a new SOS nonzero value. Rather than keying on a change in the GOOD/BAD state, the front end scanning logic must look for changes in the value of SOS. Note that this is sufficient also to produce GOOD/BAD messages. A message is still defined as GOOD if the SOS is zero, and BAD otherwise.

***Implementation details***

In order to detect changes in the SOS pattern, there must be a place to remember the previous value. For combined binary status word channels, there is neither need for a setting word nor a motor count word. The motor count word will be chosen to retain the previous SOS value. At alarms reset time, it will be necessary to zero all such motor count words, so that the initial SOS value is one that means no error status bits are present, and thus the device is in the GOOD state.

During the alarm scan, evaluate the SOS value and compare it with the saved value. If they differ, an alarm message must be generated. It will be GOOD or BAD, depending upon whether the new SOS is nonzero. The Classic alarm message format includes space for the reading, setting, nominal, tolerance, and motor count fields. In this case, the motor count field will be set to the SOS value. If a change is detected in the SOS, but it is from one BAD state to another, reset the BAD status bit so that when ASNEW toggles it, it will maintain it as BAD.

In the QMonitor task, which reviews all messages that have been sent to the network, any alarm messages are passed to a message queue that delivers it to the AERS local application, whose job it is to shepherd Acnet alarm messages to AEOLUS. The structure of the information passed in the message queue is as follows:

| *Field* | *Size* | *Meaning* |
|---|---|---|
| MGATYPE | 2 | Alarm message type: 0=analog, 1=binary, 3=comment |
| MGFLAGS | 2 | Alarm flags word |
| MGINDEX | 2 | Analog channel#, binary bit#, or comment# |
| MGREADG | 2 | Analog/digital reading |
| MGATIME | 8 | Alarm time-of-day in BCD (format Yr-Mo-Da-Hr-Mn-Sc-Cy) |

There is not room in this structure to house the SOS. (The reading word is part of the SRP message format, so we still need the reading.) The time-of-day is not used by AERS, so it may be replaced with the SOS, at least the Yr-Mo portion. So QMonitor retrieves the SOS value from the "motor count" word in the Classic format alarm message block and passes it to AERS via the first two bytes of the MGATIME field in the message queue structure. The last 6 bytes could be used for recording the Da-Hr-Mn-Sc-Cy portion of the time-of-day, although it has not yet been used at all.

In the AERS logic, the array of ERPs that are built to house Acnet alarms comprise the ERM message. To continue to treat this structure as an array, the size of each element must be equal. ERPs are usually 16 bytes in length, whereas SRPs are 20 bytes in length. But each allows for an optional parameter part to be appended. If we use 4 bytes of parameter value to append to each ERP, then the sizes of each format will be equal. The parameter value would simply be set to zero for definiteness.

The source code changes for support of SRPs are spread over 3 files. The Alarms task must change to check for changes in SOS value, rather than merely looking for GOOD-BAD changes. The QMonitor task must include the SOS value in the message queue element it sends to AERS. And AERS must send SRPs for digital alarms.